Studies on Anisotropy in the Velocity of Crystal Growth. (I)

AUTHOR(S):

Takaki, Hideo; Koyama, Masashige; Fujihira, Hidekiyo

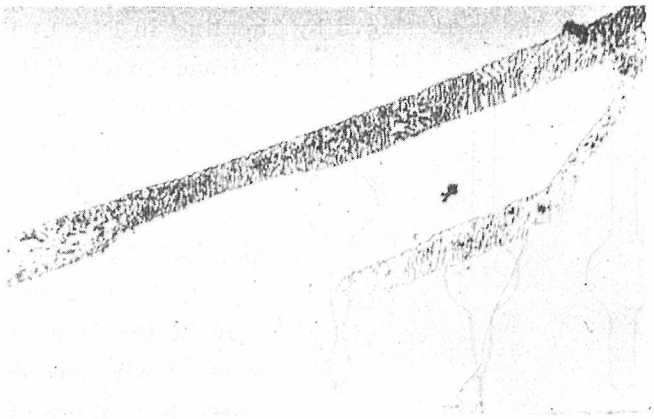

Fig. 2. ×700

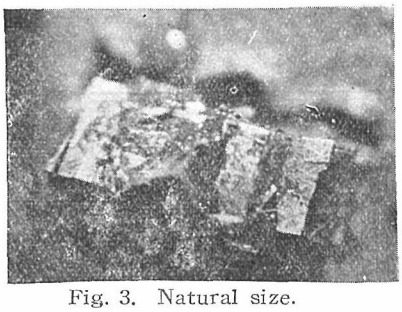

Fig. 3. Natural size.

(2) When the ingot was cut to take out specimens by acetylene gas, many cracks were induced in specimens thus obtained by thermal stress. One of these specimens was then divided by hammering along these cracks. The fracture thus formed was not intergranular but crystalline, and it was found by X-ray analysis that the fracture planes were parallel to (100) or (112) (Fig. 3).

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6. Studies on Anisotropy in the Velocity of Crystal Growth. (1)

Hideo TAKAKI, Masashige KOYAMA and Hidekiyo FUJIHIRA

(H. Takaki Laboratory)

It was formerly found by one of the authors that the velocity of crystal growth was very different with respect to the crystal direction in nickel and silicon-steel. In this work, the spherical single crystal of tin, the melting point of which is far lower than that of materials above mentioned, was firstly prepared. As it seems that if the velocity of crystal growth of tin is different with respect to the crystal direction, the shape of spherical single crystal should be changed when it is immersed into the supercooled liquid tin the immersing experiment was carried out.

The results are briefly described below:

1) The glass mould shown in Fig. 1 was made from the glass tube of 8mm in diameter in order to prepare the spherical single crystals. After the melted tin (99.92 % in purity) was sucked into the glass mould, this

mould was sealed at the part shown by the line in Fig. 1. In the electric furnace in which the nichrom wire was wound closely at the both ends, the specimen thus prepared was remelted at the part kept at a temperature above the meliting point of tin (here, specimens were always held at the definite position in the furnace), and then it was slowly put down. In this case, three types of glass mould (Fig. 2) were adopted.

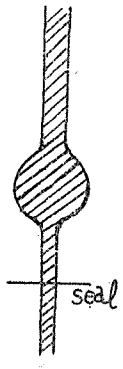

Fig. 1.

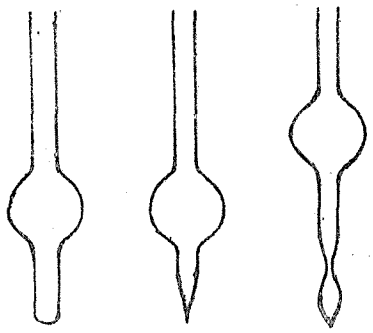

Fig. 2.

The experimental result is given in Table 1.

Table 1.

Type	Melting Temp. (°C)	Vel. of Putting down (cm./hr.)	Success (times)	Unsuccess (times)
a	252~282	2.04~14.0	0	8
b	282	1.0~6.6	2	13
	292	3.0~6.8	2	2
c	322	4.7~8.0	13	2

Success: Perfect single crystal was obtained.

It is found from Table 1 that the method *c* is very effective.

2) 50 gr. tin was used for the experiment of supercooling and the crucible for chemical analysis was used in order to melt it. The electric furnace was composed of two parts and the upper-part of it was used for supercooling and the lower-one was used for melting. The tin was melted at a temperature above its melting point and then the crucible holding liquid tin in it was carried up to the upper-part which was previously kept at a temperature below the melting point of tin. The result thus obtained is given in Table 2.

In this experiment, the time which was held at a supercooling temperature, was unexpectedly short. But this result seemed to be due to the formation of oxide on the liquid surface.

3) The spherical single crystals of 6mm. in diameter which are prepared by means of the method *c* shown in Table 1, were sunk into the fluoric acid and taken out from the glass moulds. These seeds (single crystal) were electropolished under the condition shown in Table 3.

Table 2.

T_1 (°C)	t_1 (min.)	T_2 (°C)	t_2 (min.)	T_0-T_2 (°C)	t_0 (min.)	Temp. Change (°C)
260	8	225	3	7	15	±1
ditto	7	226	4	6	15	ditto
ditto	9	225	3	7	10	ditto
ditto	7	230	2	2	60	ditto
ditto	6	231	1	1	80	ditto
ditto	7	231	1	1	90	ditto
ditto	8	230	1	2	40	ditto

T_1: Melting temp.; T_2: Supercooling temp.; T_0: Melting point; t_1: Time from melting temp. to melting point; t_2: Time from melting point to supercooling temp.; t_0: Time of supercooling.

Table 3.

Electrolysis Solution	Perchlorc Acid: 19.4% Acetic Anhydride: 80.6%
Current Density	0.75 A/cm².
Time	0.5~1 min.

These electropoliched seeds were immersed into the liquid tin which was supercooled at 2°C below the melting point of tin, from both the room temperature and the supercooling temperature. The growth of seed was partially observed in the former but not in the latter, probably due to the formation of oxide on the surface of seed.

From the experimental results of (1) and (2) above mentioned, it was found that the method adopted in this experiment was unsuitable to accomplish our aim when operated in air but should be operated in vacuum.

7. Study on Surface Electricity. (XVI)

On the Theory of U-effect —— Continued

Akira WATANABE, Fukuju TSUJI, Kazuo NISHIZAWA and Shizuo UEDA

(Tachi Laboratory)

As was already mentioned before, U-effect II is a phenomenon based on the capacity current of the interfacial double layer due to the periodical change of the interfacial area with its mechanical vibration. Hence, following derivation applies to this phenomenon.

An ideal polarized electrode is equivalent to a series combination of a